Relational database schema for Library management system

EMPLOYEE

Date of bir	Email	Salary	Employ_Id	Name	Library ID(FK)

LIBRARY

Library ID	Name	Novels	Magazines	papers	comics	Location

MEMEBERS

Department	Member index	Firstname	Lastname	No of books allow	Expire Date

BOOK

ISBNno	author	price	edition	Library ID(FK)	No of copy	Publisher ID(FK)	Fname	Lname

CUSTOMER

Customer ID	Fname	Lname	Date of birth	Firstname	Lastname

PUBLISH

Publisher ID	name	Year of publication	Address

PAYMENT

Transaction ID	Amount

PERSON

Person_Id	Detail

PUBLISHED BY

ISBN_number(FK)	Publisher_Id(FK)

STUDENT

Student_Id	Student name

TEACHER

Teacher_Id	Teacher name

OTHERS

Other's_Id	Other's name

AUTHOR

Author_Id	Author name	Email	Website

WRITTEN_BY

ISBN_number (FK)	Author_Id (FK)

EMPLOYEE_CONTACT

Phone number

CUSTOMER_CONTACT

Contact (FK)

ER to Relational Mapping

Step 1: Mapping of Regular Entity Types

- ❖ For each regular (strong) entity type E in the ER schema, create a relation R that includes all the simple attributes of E.
- ❖ Include only the simple component attributes of a composite attribute.
- ❖ Choose one of the key attributes of E as the primary key for R.
- ❖ If the chosen key of E is a composite, then the set of simple attributes that form it will together form the primary key of R.

CUSTOMER

Customer ID	FName	LName	Date of birth

EMPLOYEE

Date of Birth	Email	Salary	Employee ID	Name

LIBRARY

Library ID	Name	Novels	Magazines	papers	Comics	Location

BOOK

ISBN number	price	catagory	Edition	No of copies

PUBLISH

Publisher ID	name	Year of publication	Addres

PAYMENT

Transaction ID	Amount

AUTHOR

Author_id	Author name	Email	Web site

Step 2: Mapping of Weak Entity Types

- ❖ For each weak entity type W in the ER schema with owner entity type E, create a relation R and include all simple attributes of W as attributes of R.
- ❖ Include as foreign key attributes of R, the primary key attribute(s) of the relation(s) that correspond to the owner entity type(s)
- ❖ For each weak entity type W in the ER schema with owner entity type E, create a relation R and include all simple attributes of W as attributes of R.
- ❖ Include as foreign key attributes of R, the primary key attribute(s) of the relation(s) that correspond to the owner entity type(s)

MEMEBERS

Mem inde	department	Fullname	No of book allow	ISBN_numb (FK)	Expire Date

Step 3: Mapping of Binary 1:1 Relationship Types

- ✓ In the thrid step of mapping which has three components we choose the first approch because it is the best option to work and it is suitabke for our ER diagram of library management system.

Foreign key approach:

- ❖ For each weak entity type W in the ER schema with owner entity type E, create a relation R and include all simple attributes of W as attributes of R.

❖ Include as foreign key attributes of R, the primary key attribute(s) of the relation(s) that correspond to the owner entity type(s)

✓ *Relation between PAYMENT and BOOK (FOR relation)*

PAYMENT

Transaction_Id	Amount	ISBN_number(FK)

Step 4: Mapping of Binary 1:N Relationship Types

❖ Identify the relation S that represents the participating entity type at the N-side of the relationship type.
❖ Include as foreign key in S the primary key of the relation T that represents **the other entity type participating in R**
❖ Include any simple attributes (or simple components of composite attributes) of the 1:N relationship type as attributes of S.

Relationship types MAKES,RENT,CARRY,REFERENCE

CUSTOMER   REFERENCE

CUSTOMER

ISBN no	price	catag	edition	Copies	Issue_day	Lib_Id	Customer_id	Refer_no	Quantity	Due Date

PAYMENT   MAKES

Transaction_Id	Amount	Customer_id(FK)

Step 5: Mapping of Binary M:N Relationship Types

❖ For each binary M:N relationship type R, create a new relation S to represent R.

- ❖ Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types;
- ❖ their combination will form the primary key of S.
- ❖ Also include any simple attributes of the M:N relationship type as attributes of S.

WRITTEN_BY relation   **from Author**

ISBN_number	Author_id

From Book
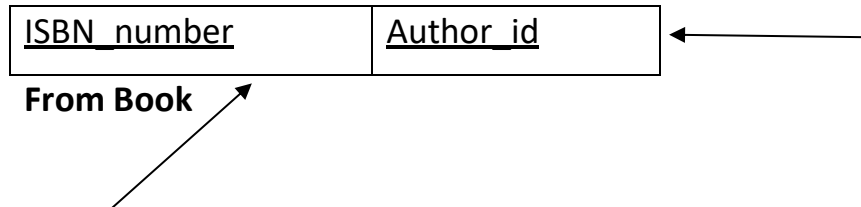
Step 6: Mapping of Multivalued Attributes

- ❖ For each multivalued attribute A, create a new relation R.
- ❖ This relation R will include an attribute corresponding to A, plus the primary key attribute K—as a foreign key in R—of the relation that represents the entity type or relationship type that has A as a multivalued attribute.
- ❖ The primary key of R is the combination of A and K.
- ❖ If the multivalued attribute is composite, we include its simple components.

Contact and phone number represents the multivalued attribute of CUSTOMER and EMPLOYEE respectively.

CUSTOM_CONTACT

Cust_Id	Cust_contact

EMP_phone no

E_Id	E_phone num

Step 7: Mapping of N-ary Relationship Types

➢ In this step each R in the relation has a N-ary relation so in our case we don't have such kind of relation in this librar management system enhanced enetity relation diagrm sample.
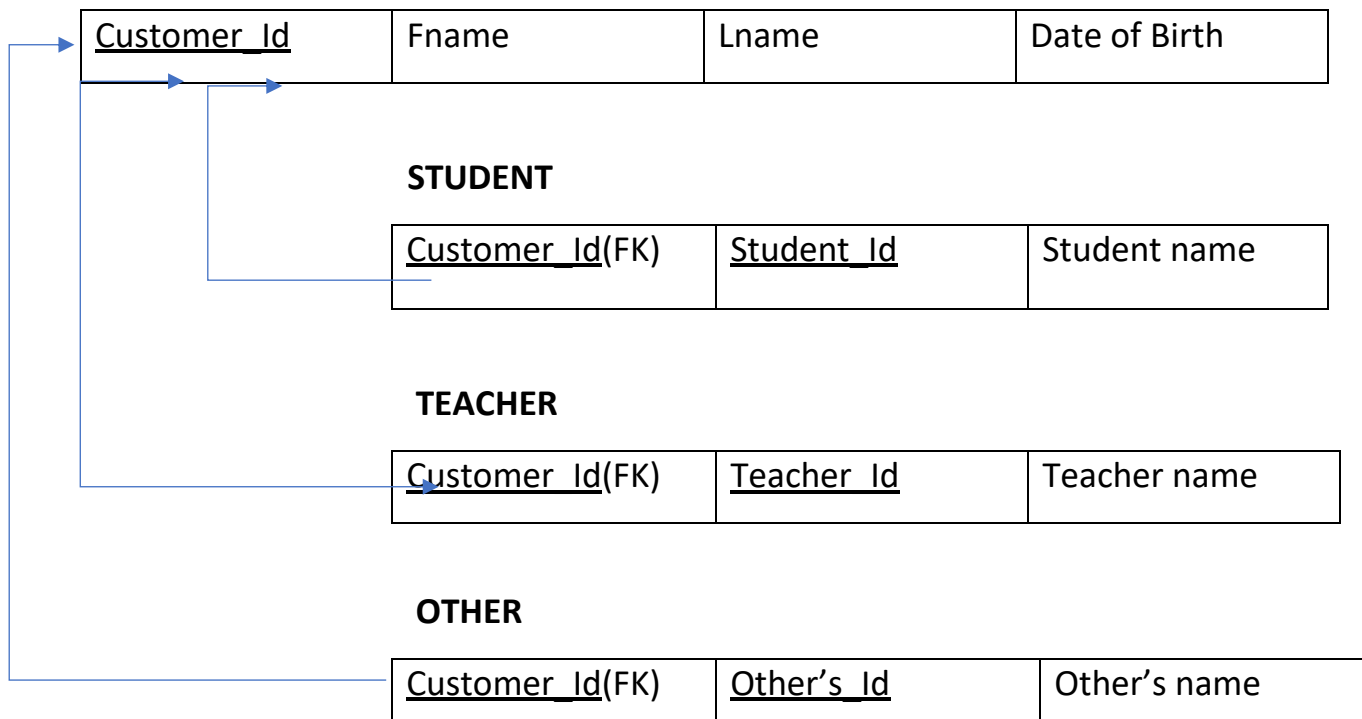
Step 8: for Mapping Specialization or generalization

8.1) Option A: Multiple relations—superclass and subclasses

❖ Create a relation L for C with attributes Attrs(L) = {k, a_1, ..., a_n} and PK(L) = k.

❖ Create a relation L_i for each subclass S_i, $1 \leq i \leq m$, with the attributes Attrs(L_i) = {k} ∪ attributes of S_i} and PK(L_i) = k.

This option works for any specialization (total or partial, disjoint or overlapping).

CUSTOMER (Disjoint)

Customer_Id	Fname	Lname	Date of Birth

STUDENT

Customer_Id(FK)	Student_Id	Student name

TEACHER

Customer_Id(FK)	Teacher_Id	Teacher name

OTHER

| Customer_Id(FK)	Other's_Id	Other's name

8.2) Option 8: Single relation with multiple type attributes.

❖ Each ti, 1 ≤ i ≤ m, is a Boolean type attribute indicating whether a tuple belongs to subclass Si.

❖ This option is used for a specialization whose subclasses are overlapping (but will also work for a disjoint specialization).

PERSON

Person_id	Detail	Cflag	Cust ID	FName	LName	DOB	Eflag	DOB	Email	Salary	Name

Relationship Cardinality

	One
	Many
	One and only one
	Zero or one
	One or many
	Zero or many
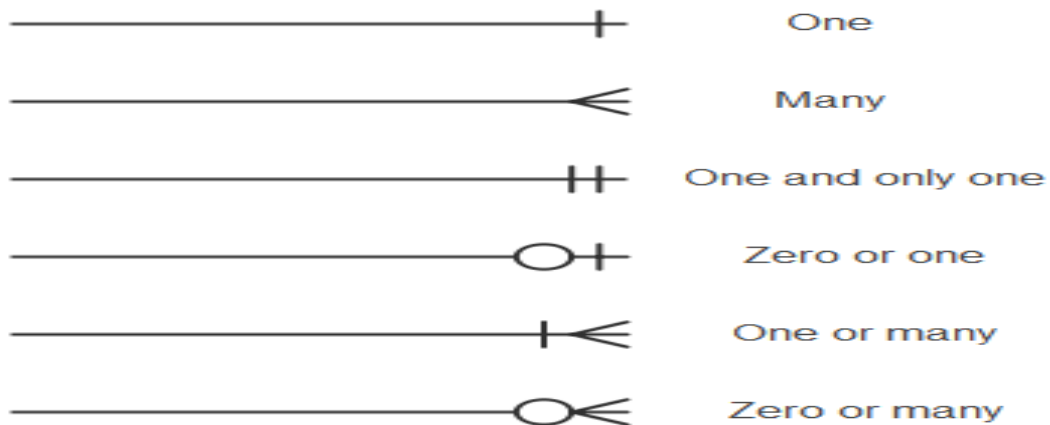
Entities and their Attributes

- **Book Entity :** It has auth no, ISBN_ number, title, edition, category, price. ISBN is the Primary Key for Book Entity.

- **customer Entity :** It has User Id, Email, address, phone no, name. Name is composite attribute of first name and last name. contact is multi valued attribute. Customer_id is the Primary Key for Readers entity.

- **Publisher Entity :** It has Publisher Id, Year of publication, name. Publisher ID is the Primary Key.

- **Library Entity**:-it has Library_id, name, novels, magazines, papers, comics, location.

- **Member Entity**:-it has department, Member index, first name, last name, numbe of book allowed, member_id, Expire Date.

- **Employee Entity**:- it has Date of birth, Email, Salary, Employee _id, name.

- **Payment Entity**:-it has transaction date, Amount.

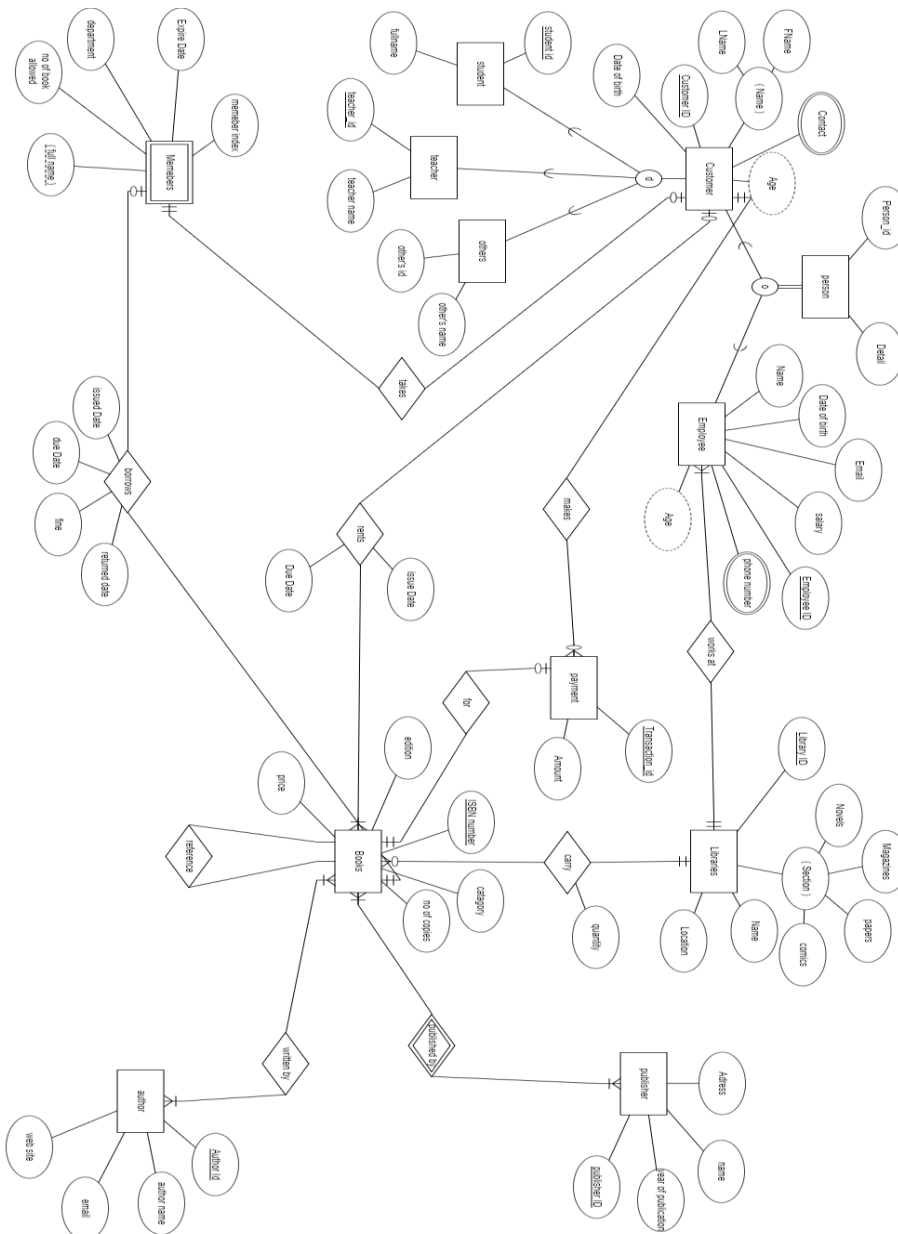## THE LOGIC OR RULE OF THE LIBRARY MANAGEMENT SYSTEM

- A single student can borrow or subscribe to multiple books, which means a one-to-many relation needs to exist between both these entities.
- A student can later become a member once they have paid a fee, so there should be space in the ER diagram for up-gradation between these entities.
- It would be best if we are varying that every book in the library is identified with a different ID. This means we need to create a different book identification so book entity has different id number.
- In a library, multiple members or students enroll themselves. These require a unique ID to identify them properly so we have a member and student identification for both.
- When issuing books, there needs to be a due date set in place to return that book, which requires another addition in the ER Diagram.
- The customer who use the library can be any one like the students , the teachers and other's. we can conclude that every reader who wants to use the library book need to have an identification card .
- Readers can return/reserve books that stamps with issue date and return date. If not returned within the prescribed time period, it may have a due date too.
- There could be more than one copy of a book and library members should be able to check-out and reserve any copy but we call each copy by book like book item which is found in book entity.
- There is number of book allowed to take. In our library management system we assumed that library is limited to give books if the customer takes the book to home and the must

not be able to borrow other book until they returned the first book so that there is a relation between members and book.

- We also allowed the publisher to publish many book and also we thought that many books like reference books are one can be published by different publisher and different author by integrated work can publish a book in this case the author and publisher has many to many relation with book.

The Enhanced Entity-Relationship (EER) Model

The EER model includes *all the modeling concepts of the ER model* that were presented.

CONVERSION OF ER DIAGRAM TO RELATIONAL SCHEMA

Employee
- Date of birth
- Email
- salary
- Employee ID   (U)
- Name
- Library ID   (FK)

Libraries
- Library ID
- Name
- Novels
- Magazines
- papers
- comics
- Location

Memebers
- department
- memeber index
- no of book allowed
- Expire Date
- ISBN number   (FK)

Employee_phone number
- phone number

person
- Detail
- Person_id

Books
- ISBN number
- price
- catagory
- edition
- no of copies
- Library ID   (FK)

payment
- Transaction_id
- Amount
- ISBN number   (FK)

published by
- ISBN number   (FK)
- publisher ID   (FK)

others
- other's id
- other's name

Customer
- Customer ID   (U)
- FName
- LName
- Date of birth

author
- Author id
- author name
- email
- web site

Customer_Contact
- Contact

publisher
- publisher ID
- name
- year of publication
- Adress

teacher
- teacher_id   (U)
- teacher name

student
- fullname
- student id   (U)

written by
- ISBN number   (FK)
- Author Id   (FK)